CLAIMS

We claim:

1. An image sensor, comprising:

a sensor array comprising a two-dimensional array of pixel elements, said sensor array outputting digital signals as pixel data representing an image of a scene, said pixel elements comprising a first group of photodetectors having a first sensitivity level and a second group of photodetectors having a second sensitivity level;

wherein said first group of photodetectors generates said output signals after a first exposure time and said second group of photodetectors generates said output signals after a second exposure time, said first exposure time and said second exposure time being within a snapshot of said scene and said first exposure time being different than said second exposure time.

2. The image sensor of claim 1, wherein said second sensitivity level is lower than said first sensitivity level and said second exposure time is longer than said first exposure time.

3. The image sensor of claim 1, wherein said first group of photodetectors is disposed to capture a first color spectrum of visible light and said second group of photodetectors is disposed to capture a second and different color spectrum of visible light.

4. The image sensor of claim 3, further comprising:

a two dimensional array of selectively transmissive filters superimposed and in registration with each of said pixel elements, said array of

selectively transmissive filters includes a first group of filters associated with said first group of photodetectors for capturing said first color spectrum of visible light and a second group of filters associated with said second group of photodetectors for capturing said second color spectrum of visible light.

5. The image sensor of claim 4, wherein said array of pixel elements further comprises a third group of photodetectors having a third sensitivity level, said third group of photodetectors generating said output signals after a third exposure time different than said first and said second exposure times.

6. The image sensor of claim 5, wherein said first, second and third groups of photodetectors are disposed to capture a red, green and blue color spectrum respectively.

7. The image sensor of claim 5, wherein said first, second and third groups of photodetectors are disposed to capture a cyan, magenta and yellow color spectrum respectively.

8. The image sensor of claim 1, further comprising:

a plurality of analog-to-digital conversion (ADC) circuits located within said array of pixel elements, each of said ADC circuits being connected to one or more photodetectors for converting said output signal to a digitized pixel voltage signal.

9. An image sensor, comprising:

a sensor array comprising a two-dimensional array of pixel elements, said sensor array outputting digital signals as pixel data representing an image of a scene,

said pixel elements comprising a first group of photodetectors having a first sensitivity level and a second group of photodetectors having a second sensitivity level, said sensor array generating multiple representations of said image at a plurality of exposure times; and

a data memory, in communication with said sensor array, for storing a time index value and said pixel data for each of said pixel elements, said time index value indicating one of said plurality of exposure times in which said pixel data exceeds a predetermined threshold level and for which said pixel data is stored;

wherein said plurality of exposure times comprises a first set of exposure times and a second set of exposure times, said first group of photodetectors generates said multiple representations of said image at said first set of exposure times, and said second group of photodetectors generates said multiple representations of said image at said second set of exposure times, said first set of exposure times and said second set of exposure times being within a snapshot of said scene and said first set of exposure times including at least one exposure time different than said second set of exposure times.

10. The image sensor of claim 9, wherein said sensor array and said data memory are fabricated in an integrated circuit.

11. The image sensor of claim 9, wherein said data memory further stores a threshold indicator value for each of said pixel elements indicating whether said pixel data

for each of said pixel elements has exceeded said predetermined threshold level.

12. The image sensor of claim 9, wherein said second sensitivity level is lower than said first sensitivity level, and a last exposure time in said second set of exposure times is longer than a last exposure time of said first set of exposure times.

13. The image sensor of claim 9, wherein said first group of photodetectors is disposed to capture a first color spectrum of visible light and said second group of photodetectors is disposed to capture a second and different color spectrum of visible light.

14. The image sensor of claim 13, further comprising:

a two dimensional array of selectively transmissive filters superimposed and in registration with each of said pixel elements in said sensor array, said array of selectively transmissive filters includes a first group of filters associated with said first group of photodetectors for capturing said first color spectrum of visible light and a second group of filters associated with said second group of photodetectors for capturing said second color spectrum of visible light.

15. The image sensor of claim 9, further comprising:

a plurality of analog-to-digital conversion (ADC) circuits located within said sensor array, each of said ADC circuits being connected to one or more photodetectors for converting said output signal to a digitized pixel voltage signal.

16. The image sensor of claim 9, wherein the exposure times within said first set of exposure times are spaced apart in a non-linear manner.

17. The image sensor of claim 9, wherein the exposure times within said second set of exposure times are spaced apart in a non-linear manner.

18. An imaging system, comprising:

a first image sensor having a first sensitivity level, said first image sensor generating output signals representing an image of a scene; and

a second image sensor having a second sensitivity level, said first image sensor generating output signals representing an image of a scene;

wherein said first image sensor generates said output signals after a first exposure time and said second image sensor generates said output signals after a second exposure time, said first exposure time and said second exposure time being within a snapshot of said scene and said first exposure time being different than said second exposure time.

19. A method for generating electrical signals representing an image in an image sensor, said image sensor comprising a first group of photodetectors having a first sensitivity level and a second group of photodetectors having a second sensitivity level, comprising:

generating output signals as pixel data indicative of a light intensity impinging on said first group of photodetectors at a first exposure time within a snapshot of a scene, said pixel data being associated with each photodetector in said first group of photodetectors; and

generating output signals as pixel data indicative of a light intensity impinging on said second group of photodetectors at a second exposure time different than said first exposure time and within said snapshot of said scene, said pixel data being associated with each photodetector in said second group of photodetectors.

20. The method of claim 19, wherein said second sensitivity level is lower than said first sensitivity level and said second exposure time is longer than said first exposure time.

21. The method of claim 19, wherein said first group of photodetectors is disposed to capture a first color spectrum of visible light and said second group of photodetectors is disposed to capture a second and different color spectrum of visible light.

22. A method for generating electrical signals representing an image in a digital image sensor, said digital image sensor comprising a first group of photodetectors having a first sensitivity level and a second group of photodetectors having a second sensitivity level, comprising:

generating digital signals as pixel data indicative of a light intensity impinging on said first group of photodetectors at a first plurality of exposure times within a snapshot of a scene;

generating digital signals as pixel data indicative of a light intensity impinging on said second group of photodetectors at a second plurality of exposure times within said snapshot of said scene; and

storing in a data memory a time index value and said pixel data for each photodetectors in said first

group and said second group of photodetectors, said time index value indicating one of said first and second plurality of exposure times in which said pixel data exceeds a predetermined threshold level and for which said pixel data is stored.

23. The method of claim 22, wherein said second sensitivity level is lower than said first sensitivity level and said second exposure time is longer than said first exposure time.

24. The method of claim 22, wherein said first group of photodetectors is disposed to capture a first color spectrum of visible light and said second group of photodetectors is disposed to capture a second and different color spectrum of visible light.